

A brief description of all subroutines and functions used by the SFWMM v3.5 is given below.

- agarea = This subroutine simulates the water table management practices in the EAA by forcing the water table to reside within a very narrow range. Excess water is removed from the soil and routed through the outlet structures or to a reservoir. Irrigation requirements are met from a source (LOK or reservoir) and added to the recharge term.
- ainterp = function that linearly interpolates between break points; typically used in defining a daily regulation schedule.
- alloc_to_eaa = calculates the amount (volume) of water determined by supply-side management plan that is in excess of the demand in LOSA. This excess water is routed to the EAA to increase water levels.
- asr = performs water budget accounting for a particular Aquifer Storage and Recovery (ASR) system.
- asrinput = read in basic parameters for each ASR well.
- bpts = defines breakpoints for LOK and WCA regulation schedules.
- caloos1 = determines interaction (inflows/outflows) between Lake Okeechobee, Caloosahatchee basin and Caloosahatchee estuary; requires daily time series of basin demand/runoff and a daily time series of estuarine demands.
- caloos2 = determines interaction (inflows/outflows) between Lake Okeechobee, Caloosahatchee basin and Caloosahatchee estuary; requires daily time series of basin demand/runoff and a monthly time series of estuarine demand.
- char_read = subroutine that reads appropriate records of comments in a data file between keywords "BEGCOMM" and "ENDCOMM".
- cgseep = function that calculates groundwater seepage to/from canal to grid cell where canal passes through; performs calculation for canal reaches.
- chnlf = calculates canal downstream stage and outflow, seepage, and overland inflow given canal upstream inflows and downstream stage from the end of the previous day.
- cnldata = subroutine to open and read canal data files.
- daily_ovlnf_out = writes out to binary file daily flow volume information from two-

dimensional overland flow calculations.

ds_flow = returns equilibrium canal tailwater and downstream structure discharge given canal headwater, upstream structure discharge and tailwater for the downstream structure; uses look-up table values for canal conveyance capacity. Performed for major EAA canals only.

dsds_flow = returns equilibrium interior headwater and tailwater stages, downstream discharges given upper canal headwater and lower structure tailwater for a structure-canal-structure-canal- structure system in the EAA; uses look-up table values for canal conveyance capacity. Performed for major EAA canals only.

dstring = makes a good looking date string from the month, day, year values.

eea_neutral_caps = calculates conveyance capacities for the major EAA canals for the neutral (no EAA runoff/no EAA demand) case

eea_prof_lu_table = returns the flow rate (q); upstream stage (chw); or downstream stage (ctw); given the values of the other two open-channel flow variables.

eea_prof_lu_table12 = an extension of subroutine eea_prof_lu_table where structures of known properties exist at both ends of the reach. Profiles 1 & 2 refer to the Miami and North New River Canals. returns the flow rate (q); upstream stage (lake stage); or downstream stage (S8_TW or S7_TW); given the values of the other two open-channel flow variables.

eea_prof_two_reaches = returns the flow rate (q); upstream stage (cuhw); or downstream stage (cltw); given the values of the other two open-channel flow variables for a two-reach system with a spillway structure in the middle.

eaacorr = make stage adjustment for US Sugar Ranch if treated separate from other EAA basins; distributes excess runoff and irrigation requirements generated in the EAA water table management subroutine (agarea) for each EAA node.

eaapumpq = function that calculates flow through major pump stations in the EAA.

eaaspill = calculates flow through a major spillway in the EAA.

est_etiu = function that returns an estimate of monthly unsaturated zone ET for 1 of 6 irrigation use types (urban landscape, nursery, golf course, ag-lowvolume, ag-overhead, and ag-other) for the LECSAs.

etcomp = evapotranspiration calculation for each cell.

flow_to_stas = the purpose of this subroutine is to route excess water and environmental water supply from appropriate areas to the corresponding STAs.

ftrapcom = function that is activated from the main program to trap IEEE errors; causes program to signal non-fatal errors but continue execution, and abort if errors encountered are fatal.

get_tide = function that fetches the current cell's tide for current time step (day) based on six locations with mean monthly historical tidal stages.

getarg = system function that extracts a set of character strings to the right of the executable (e.g. input filename) when the program is invoked on the command line. Used to identify SFWMM input definition file. (default name: ALTWMM)

getenv = system function that is called from the main program and retrieves the value of any environment variable. In the model it is used to retrieve the value of environment variable "SFWMMDAT". "SFWMMDAT" contains the directory name in which the output files will be written into. If this environment variable is not set prior to the model execution, then all output files will be written in the current directory.

getfd = system function that gets file descriptor (file unit number) for a binary file in *grid_io* format; this function is used in order to properly interface the *grid_io* library which is written in "C" and the SFWMM which is written in "Fortran."; Applicable to the SUNOS version of the SFWMM only.

go_lu_table = subroutine that returns the value of one of the following spillway flow variables: gate opening (go), upstream stage (shw) or downstream stage (stw) given the values of the other two.

gread = reads a snapshot of data from a binary file in *grid_io* format; (e.g. rainfall).

gridrhd = reads header of a binary file in *grid_io* format.

gridwhd = writes header of a binary file in *grid_io* format.

gridskip = skips a user-specified number of snapshot in a *grid_io* file and sets pointer (for next read) at appropriate location in the binary file.

gwf = solve the groundwater equation; computes groundwater head at each node.

gwrite = writes a snapshot of data to a binary file in *grid_io* format.

hlreg = function that determines maximum stage in Holeyland at which inflow

(runoff from Miami Canal basin) could occur.

iag = integer function which returns EAA index corresponding to EAA canal basin; Index is used to keep track of water excess and deficiencies generated from structure capacity limitations and/or cutbacks due to supply-side management in the EAA.

indata = open I/O files and retrieve physical data required by model.

init = initializes several variables in the model.

julian = function that computes a Julian day number; relative or ordinal number of a day within a year.

knflows = distributes known flows to the appropriate canal or surface ponding location; seasonal adjustments to regulation schedules are also made in this subroutine.

lakewca = subroutine to calculate the environmental water supply and regulatory discharges from Lake Okeechobee to the WCAs and water supply to the Lower East Coast Service Areas.

lec_et_comp = computes ET for grid cells that are in the LEC developed area.

lec_et_initial_read = opens files used for the LEC ET calculations and reads appropriate data.

lec_et_set_cutbacks = computes values for daily net irrigation supply (per irrigation use type), daily shortages per irrigation use type, daily total net irrigation demand, daily total net irrigation supply, and daily total shortages. Daily adjusted ET in the unsaturated zone for irrigated areas, et_unsat_irr_adj, are also computed. (Daily values are summed to monthly values later in subroutine lec_et_sum_monthlies.)

lec_et_sum_monthlies = sums daily values to monthly values and writes the totals to four composite binary files containing ET information. The files are: 1) et_components.bin, 2) nirrsup.bin, 3) shortage.bin and 4) est_et.bin.

lec_et_time_series_read = reads time series data in *grid_io* format to be used in Lower East Coast unsaturated zone ET calculations.

lineout = writes out groundwater head data in fixed format; this output data is used as an input boundary condition for the 1-mile by 1-mile version of SFWMM.

locate = given an array xx of length n, and given a value x, returns a value of j such

that x is between xx(j) and xx(j+1). xx must be monotonic, either increasing or decreasing. j = 0 or j = n is returned to indicate that x is out of range.

locwslwdd = determine water supply deliveries into Lake Worth Drainage District (LWDD) from local sources of water such as C-51 basin and excess water from LWDD canals.

loketvol = function that computes daily volume of evapotranspiration from Lake Okeechobee, calculates evapotranspiration from "no-water" littoral zone, wet littoral or marsh zone and open water zone, and sums for lake total. Calls real functions stg2ar and stg2mar for surface areas of corresponding lake zones.

lvseep = calculates seepage beneath protective levees into borrow canals.

map_lec_array_to_model = transforms the indices of an LEC developed area 1-D array to a model 1-D array, and converts the units from inches to feet.

map_lec_node_to_model = transforms the indices of a model 1-D array to an LEC developed area 1-D array.

monchk = function that converts relative month number to the regular 12-month index (e.g. The 27th month after February 1989 is May 1991. Function monchk returns a value of 5 because May is the fifth month of the calendar year.)

nmosdiff = function that computes the number of months between two dates.

northlok_res = subroutine that performs water budget for proposed North Lake Okeechobee reservoir; returns the release from the reservoir to LOK and inflow from LOK to the reservoir.

ovlnf = overland flow calculations for each cell.

printlp = print out the desired arrays when called by main program.

qmax_one_reach = calculates the conveyance capacity for a spillway-canal-spillway reach within the EAA.

qmax_two_reaches = calculates the conveyance capacity for a spillway-canal-spillway-canal-spillway reach within the EAA.

qpulse = determine if lake stage is within the 3-level pulse zone. This routine is

called every time the lake stage goes below Zone C of the regulation schedule.

readtk = reads mid-month crop coefficients for each landuse type and convert to actual day value depending on the relative position of the current day to two mid-month values.

reduce_wellq = For public water supply, applies reduction factor to wells affected by water restriction. For each irrigation use, returns a maximum application rate to grid cells affected by water restriction.

resasr_sim = simulates the proposed reservoir/ASR systems in the Caloosahatchee and St. Lucie basins.

resoutlim = function that calculates the maximum discharge through the outlet structures of a reservoir to a receiving canal without aggravating flood control conditions downstream.

route = calculate discharges based upon different operating criteria. This subroutine will return the KFLO array to subroutine knflows.

s340sch = function that gives operation schedule for S-340 and S-339 based on gauging station 3A-2.

sched = function that gives operational schedule in conjunction with supply-side management.

set_cutback = computes which zones require pumping cutbacks.

simcstg2dss = writes daily flows for simulated canal stages into output DSS file "canal.dss"; If pathnames already exist, they are overwritten.

simq2dss = writes daily flows for simulated structures into output DSS file "str2x2.dss." If pathnames already exist, it writes over them.

ssm = Given Lake Okeechobee stage, storage and date this function computes water supply releases to the Lake Okeechobee Service Area. This plan takes effect when the lake stage is projected to fall below 11' NGVD at the end of the dry season. The function is based on the documentation on the Lake Okeechobee Supply-Side Management Plan (Hall, 1991).

ssmwet = Given Lake Okeechobee stage, storage and date this function computes water supply releases to the Lake Okeechobee Service Area. This plan takes effect when the lake stage is projected to fall below 10.5' NGVD during the first two months of the wet season.

staout = calculate the total discharge from the outlet structures of a reservoir.

stastor = calculates the available storage in a reservoir.

staws = calculates the amount of water to be supplied from Lake Okeechobee to maintain desired water level in a reservoir.

stg2ar = function that computes the water surface area of Lake Okeechobee (acres) from a given stage (ft NGVD).

stg2mar = function that computes the littoral zone surface area of Lake Okeechobee (acres) from a given lake stage.

stg2sto = function that computes Lake Okeechobee stage (ft NGVD) from the storage (ac-ft) or vice-versa. Base data is in breakpoint format (tabulation of stage versus storage).

stlucie1 = determines interaction (inflows/outflows) between Lake Okeechobee, St. Lucie basin and St. Lucie estuary; requires daily time series of basin demand/runoff and a daily time series of estuarine demands.

stlucie2 = determines interaction (inflows/outflows) between Lake Okeechobee, St. Lucie basin and St. Lucie estuary; requires daily time series of basin demand/runoff and a monthly time series of estuarine demand.

strout = function that calculates downstream discharge at a specified structure for specified headwater and simulated tailwater; this function is used to help determine the maximum (limit) discharge that could be passed through the structure without causing flooding conditions downstream.

sum_trig_heads = sums simulated heads at trigger cells for a user- specified number of days during the month.

taycrnbs_res = subroutine that performs the water budget of the proposed Taylor Creek/Nubbin Slough reservoir; Determines the portion of flow from Taylor Creek/Nubbin Slough to the proposed reservoir and portion of flow directly to LOK which bypasses proposed reservoir.

tideinterp = function that linearly interpolates within a real array (y) using a real array (x) as ordinates. Assumes ordinates are in ascending order.

tovflc = function that determines the total surface flow interaction between canal and grid cells through which canal passes.

trigger_input = reads input data for the trigger module.

us_flow = calculates equilibrium canal headwater and upstream structure discharge given canal tailwater, downstream structure discharge, and headwater for the upstream structure in a structure-canal-structure configuration in the EAA.

usus_flow = calculates equilibrium interior headwater and tailwater stages and upstream discharges (refer to Sec. 3.3 -- Fig 3.3.5).

val2val_w_lok = creates an array containing active SFWMM cell stage minus land_surface_elevation values plus lake_stage minus bathymetry values.

vol18c = function that calculates daily flow through structure S-18C based on the minimum delivery schedule to ENP.

vol332 = function that calculates daily flow, based on the minimum delivery schedule, to Taylor Slough.

volenp = function that calculates daily flow, based on the minimum delivery schedule, to Everglades National Park.

wcaout = determines the discharges at the outflow structures of the WCAs. Discharges are stored in the KFLO array.

wroute = determines the discharge at the outflow structures that are input by the user for each canal. This subroutine is called by the chnlf subroutine.

ws_from_res = computes water supply discharges from reservoir to appropriate destination(s).

wsneeds = determines the total surface water requirements for water supply in the Lower East Coast. The need is defined as the volume of water required to maintain the canals at desired minimum levels during dry periods. The water, if available, is delivered from the appropriate WCA or Lake Okeechobee. The needs are determined for every canal reach to be maintained by the storage areas.

xy = get x,y position of grid cell based on linearized array of cell indices.

ymddat = HECLIB function that converts integer year-month-day date into a character date.

zclose = HECDSS function that closes a DSS file.

zfpn = HECDSS function that forms a DSS pathname.

`zopen` = HECDSS function that opens a DSS file.

`zpath` = HECDSS function that constructs a DSS pathname.

`zrts` = HECDSS function that retrieves regular interval time series data.

`zset` = HECDSS function that sets DSS parameters.